

A Mixed Method Approach for Evaluating Spatial Data Sharing Partnerships for SDI Development

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Abstract

In recent years inter-jurisdictional partnerships have emerged as an important mechanism for establishing an environment conducive to data sharing and hence the facilitation of SDI development. However, unless the partnership arrangements are carefully designed and managed to meet the business objectives of each partner, it is unlikely that they will be successful or sustainable in the longer term. The purpose of this paper is to focus on the methodological approaches and issues which arise when researching these new data sharing partnerships and their relationships to SDI development. In this paper a research methodology is proposed to investigate both the organisational context of data sharing partnerships and the factors that contribute to the success of inter-jurisdictional data sharing initiatives. The paper examines past research and theory in spatial data sharing and examines the characteristics of a number of existing data sharing models and frameworks. A mixed method research approach which combines both qualitative and quantitative methods using a case study strategy is then described. An example of the application of this methodological approach is then applied to the evaluation of local-state government partnerships in order to understand their characteristics and success factors. Finally, the validation of the mixed methods approach and its generalisation to other SDI and data sharing initiatives is discussed.

Introduction

Spatial information plays an important role in many social, economic and political decisions. Governments, business and the general community rely on spatial information for practical decision making on a daily basis (Onsrud & Rushton 1995). In emergency services and disaster management the value of accurate and relevant information such as address, vehicular access, location of services, property ownership, climate and topography is crucial for directing and managing response efforts. However, rarely do all of these data sets reside within the one organisation or jurisdiction and hence co-operation and data sharing amongst these organisations is essential. Although there is a history of good co-operation between local, state and national jurisdictions during disaster management, at other times the sharing of data has been problematic.

With local government being a custodian of a number of strategic spatial data sets, it has a crucial role to play in the development of the state and national spatial data infrastructures (SDIs) which rely heavily on the vertical integration of spatial data from the lower levels of government (Harvey 2000). In recent years, a number of co-

operative partnerships between local and state government have emerged. These partnerships are relatively new arrangements that have been established to facilitate the improved sharing of spatial data and to realise the full potential of a spatial data infrastructure (National Research Council 1994). However, in order to achieve maximum benefit from such arrangements it is important to understand the factors that contribute to the successful and sustainable operation of these partnerships.

Organisational, technical, legal and economic issues continue to impede the integration of spatial information in heterogeneous data sharing environments (Masser 1998; Masser & Campbell 1994; Nedovic-Budic & Pinto 2001; Onsrud & Rushton 1995). Although research has identified that these inter-organisational issues remain a priority, there have been few systematic evaluations of the mechanisms and factors that facilitate the inter-organisational efforts (Nedovic-Budic & Pinto 2001). In particular, the vertical integration of multiple levels of data across multiple levels of government continues to be a major impediment to a fully robust national SDI (Harvey et al. 1999). Masser (2005) identifies there is a pressing need for more research on nature of data sharing in a multilevel SDI environment, particularly with respect to the organisational issues.

Partnerships are considered to be essential for SDI development because they provide a mechanism to allow organisations to work together to achieve SDI goals, to share implementation responsibilities and the eventual partnership benefits (Wehn de Montalvo 2001). Experiences in several countries have identified a number of problems with establishing partnerships at every level of government. These problems include the poor structure of partnerships, lack of awareness of partnership benefits, poorly defined responsibilities of each partner, fear of losing of control of data, limited funding and lack of buy-in (Wehn de Montalvo 2001, 2003b). Although many issues have been identified, the key problem remains of “how to package these research insights into a coherent and effective program or set of guidelines” (Nedovic-Budic & Pinto 2001). Kevany (1995) also identifies that one of the most important areas of future research is to establish a set of factors (values) for both successful and unsuccessful data sharing environments which can be applied to future initiatives.

The importance of partnerships and collaboration have been promoted and reported by the National Mapping Committee of the National Research Council (National Research Council 1994, 2001) and the Geodata Alliance (Johnson et al. 2001) through documented success stories and identification of key success factors. However, these documents also identify that more rigorous efforts need to be pursued to improve our understanding of collaborative initiatives. A better understanding of the existing jurisdictional partnership arrangements could assist in the development of a more universal and successful model for collaboration. The benefits from such a model should lead to the improved development of spatial data infrastructures at all levels which in turn should impact positively on all sectors of the government, business and community.

This paper will firstly review a variety of existing data sharing models and frameworks with respect to their characteristics, strengths and limitations. The mixed methods research approach is then described as a suitable method for examining existing data sharing partnerships. This methodology will then be examined in the

context of evaluating local-state government data sharing partnerships for SDI development. Finally, the utility of this approach and its validity will be discussed.

Data Sharing Models and Frameworks

The sharing of spatial data is not new, however in recent times the importance of spatial data sharing as a mechanism for building and sustaining the development of spatial data infrastructures has been highlighted (National Research Council 1994). Several contributions have been made to the understanding of data sharing within and across organisations including the willingness of organisations to share their data. These contributions range in complexity and detail, but it is useful to review a number of these models and frameworks to gain a better understanding of existing theory and practice.

One of the early efforts to describe a classification framework for data sharing was undertaken by Calkins and Weatherbe (1995) with the development of a taxonomy for research into spatial data sharing. The four primary components of the taxonomy included the characteristics of the organisation, the data, the exchange and finally the constraints and impediments. Kevany (1995) proposed a more detailed structure to measure the effectiveness of data sharing. This structure is based on the author's experience across a range of projects, particularly at the county, municipality and city levels in the United States. Thirty factors that influence data sharing were identified under nine broad areas including sharing classes, project environment, need for shared data, opportunity to share data, willingness to share data, incentive to share data, impediments to share data, technical capability for sharing and resources for sharing.

Data sharing can also be viewed in terms of antecedents and consequences (Obermeyer & Pinto 1994; Pinto & Onsrud 1995). A framework proposed by these authors include a number antecedents, such as incentives, super-ordinate goals, accessibility, quality of relationships bureaucratisation and resource scarcity which precede the process of data sharing. The impact of these events and factors then mediate a range of data sharing consequences such as efficiency, effectiveness and enhanced decision making. Azad and Wiggins (1995) proposed a typology based on inter-organisational relations (IOR) and dynamics. The authors argue that spatial data sharing across multi-agencies is fundamentally an organisational affair and that the concept of organisational autonomy is a critical issue in data sharing.

Another framework which examines organisational data sharing is put forward by Nedovic-Budic and Pinto (1999) and draws on the Kevany model (1995) which was largely experience based. The conceptual framework draws on a broader literature base to derive four theoretical constructs namely: inter-organisational context, motivation, coordination mechanisms and outcomes. The theoretical foundations of this framework provide a very useful basis for further development and assessment of spatial data sharing initiatives. Wehn de Montalvo (2002) suggests that sharing, by its very nature, is a human behaviour and therefore it should be explored from a human behavioural context. The author investigated the theory of "planned behaviour" as an organising framework to understand the willingness to share spatial data. The model maps the process of data sharing using belief structures and the predictive power of intentional behaviour.

Table 1 summarises the various models and frameworks proposed by different authors.

Table 1: Summary of Data Sharing Models/Frameworks

| Model/Framework | Characteristics | Strengths | Limitations |
|---|---|---|--|
| Calkins and Weatherbe (1995) | Taxonomy based on characteristics of organisation, data, exchange and constraints/impediments | Framework recognises organisational issues and nature of exchange | Limited with respect to motivations, policy and capacity of organisations |
| Kevany (1995) | Factor and measurable based model | Very comprehensive list of factors that can be rated based on existing exchanges | Based on personal experience and not supported by theoretical foundations |
| Obermeyer and Pinto (1994), Pinto and Onsrud (1995) | Conceptual model based on antecedents and consequences | Based on exchange and organisational theory. Basis for further research | Mainly conceptual and has limited depth or justification of factors |
| Azad and Wiggins (1995) | Typology based on IOR and dynamics | Attempts to classify organisation dynamics and behaviour (Oliver 1990). | Lack of justification on the initial premise of data sharing leads to the loss of autonomy and independence and lack of empirical evidence |
| Nedovic-Budic and Pinto (1999) | Based on the theoretical constructs of context, motivation, mechanisms and outcomes. | Broad theoretical basis supported through later quantitative validation in later studies. | May not predict potential willingness to share data |
| Wehn de Montalvo (2003) | Based on theory of planned behaviour | Strong theoretical basis that is strengthened through a mixed methods approach | Model is predictive (by design) and may not be directly applicable to the analysis of existing initiatives. |

Each of the data sharing models or frameworks examined illustrate a range of theoretical and experiential approaches to explain the data sharing and the potential for data sharing. Increasingly, the importance of organisational and behavioural issues through the progressive research efforts is recognised and there is a growing support for theoretical models supported by a stronger quantitative evaluation. The recent application of these models and theory (Nedovic-Budic & Pinto 1999; Wehn de Montalvo 2003a) have identified the advantages of utilising both qualitative and quantitative research approaches to better understand and evaluate the success of data sharing arrangements. To understand the issues associated with data sharing within the context of a data sharing partnership a number of research questions are put forward, namely:

- 1. How can our understanding of existing inter-jurisdictional data sharing models be utilised to improve their operation and sustainability in the context of SDI development?*
- 2. How can these partnership models be more rigorously described and classified?*
- 3. What are the motivations and barriers for the participation of government partners in spatial data sharing partnerships?*
- 4. What are the factors that contribute to the success of these data sharing partnerships?*

5. *Can these factors be used to identify the capacity of each partner to successfully participate in these partnerships?*
6. *Can a generic framework or model be developed to guide future spatial data sharing partnerships?*

The first and second questions are primarily *qualitative* in nature and seek to explain the nature of the inter-jurisdictional partnerships. The next three questions are more *quantitative* in nature and seek to identify and measure a number of issues or factors. The final question requires the blending of both *qualitative* and *quantitative* approaches to better guide the development of a generic framework or model. A “mixed method” approach which integrates both qualitative and quantitative strategies is proposed as a suitable methodology to investigate these questions more fully. The theory of mixed methods is now discussed in more detail in order to demonstrate its application to the classification and evaluation of spatial data sharing partnerships.

The Mixed Method Approach Outlined

The debate over the benefits of qualitative versus quantitative methods continues, with the proponents in each camp vigorously defending the benefits and rigor of each approach (Tashakkori & Teddlie 2003). New methods in theory and practice such as participatory approaches, advocacy perspectives, critical appraisal and pragmatic ideas have continued to emerge (Lincoln & Guba 2000). However, in recent times researchers have begun to re-examine these previously isolated strategies (Creswell 2003). The field of mixed methods has developed as a pragmatic approach to utilise the strengths of both qualitative and quantitative methods.

Mixed methods research is not new, but a logical extension of the current re-examination and exploration of new practices. As Creswell (2003) identifies “Mixed methods research has come of age. To include only quantitative or qualitative methods falls short of the major approaches being used today in the social and human sciences. ...The situation today is less quantitative versus qualitative and more how research practices lie somewhere on the continuum between the two.... The best that can be said is studies tend to be more quantitative or qualitative in nature.”

The definitions for qualitative and quantitative methods vary with individual researchers, especially when the understanding of the actual methods is examined (Thomas 2003). Mixed method design can incorporate techniques from both the qualitative and quantitative research traditions in a unique approach to answer research questions that could not be answered in another way (Tashakkori & Teddlie 2003). However, the mixed method approach differs from other variants within the individual research paradigms of qualitative and quantitative (Brannen 1992) and can provide a number of advantages. Teddlie and Tashakkori (2003) identify three reasons where the utility of mixed methods research may be superior to single approach designs, namely:

1. Mixed methods research can answer research questions that other methodologies cannot;
2. Mixed methods research provides better (stronger) inferences; and
3. Mixed methods provide the opportunity for presenting a greater diversity of divergent views.

The above reasons, although general in context, provided the basis for justifying the mixed method approach as a suitable research approach in this thesis. Firstly, the mixed method approach not only enabled the exploration and description of existing partnership arrangements, particularly the “why” and “how” of the arrangements, but also facilitated the measurement or quantification of the value of these arrangements. The research questions identified previously are also difficult to answer through any single approach. A case study approach was deemed as a suitable approach to addressing the “why” and “how” questions. However, in order to gauge and evaluate the impact of large multi-participant data sharing partnerships, a quantitative approach was more appropriate. The addition of a questionnaire provided a convenient process to evaluate the success and perspectives in multi-participant partnership initiatives.

Secondly, the weaknesses of a single approach are minimised through the complementary utilisation of other methods. The qualitative case study approach provided the opportunity to investigate the organisational aspects of the partnerships in greater depth, whilst a quantitative survey of a larger number of partnership participants provided a greater breadth of views. Finally, the opportunity to investigate and present a greater diversity of views was considered important in validating the research findings. This was valuable because it led to the re-examination of the conceptual framework and underlying assumptions of each of the two methods (Teddle & Tashakkori 2003). The diversity and divergence of perspectives between government jurisdictions such as state and local government is well known. Importantly, this reflects the reality of the relationships and hence the health of the partnership arrangements.

An important consideration when using a mixed methods approach is the way in which the qualitative and quantitative methods are combined Brannen (1992). The pre-eminence of one strategy over the other have been enumerated by Bryman (1998) as three possible approaches, namely:

- a) The pre-eminence of quantitative over the qualitative
- b) The pre-eminence of qualitative over the quantitative, or
- c) The qualitative and quantitative are given equal weight

In the first approach the qualitative work may be undertaken prior to the main quantitative study and may be used as a basis for hypothesis testing, developing the research instrument or clarification of quantitative data. The qualitative work may be performed at an early stage but can also be revisited at a later opportunity. In the second approach, the quantitative study can be conducted as a preliminary to the main study or at the end of the main study. It can provide background data to contextualise small intensive studies, test hypotheses derived through qualitative methods or provide a basis for sampling and comparison. The final approach provides equal weighting to each method. The two studies are considered as separate but linked, and can be performed simultaneously or consecutively. The processes may be linked at various stages in the research process and then integrated to formulate the final outcomes.

The priority, implementation timing, stage of integration and theoretical perspectives can assist in classifying the mixed method approach (Creswell et al. 2003). The authors propose six design types through the application of these four criteria. These

design types can be used to assist researchers to identify the most suitable mixed method approach for a particular study, particularly when and how to integrate the two methods. The design types proposed by Creswell et al. are primarily classified as either sequential or concurrent. For the sequential design, the order of the quantitative and qualitative studies may be dictated by the research problem and whether a more exploratory or explanatory approach is required. Alternatively, the two studies could be conducted concurrently with the results of each study being interpreted during the analysis stage.

The mixed methods approach is not without its problems and care must be taken in the integration and interpretation phases of the research (Bryman 1992). However, when properly combined and guided by an understanding of the research purposes and problems, the mixed methods approach is a powerful research strategy. To more clearly illustrate the mixed methods approach, its application for the classification and evaluation of local-state government spatial data sharing partnerships is now examined from a methodological perspective.

Application of the Mixed Methods Approach to Assess Data Sharing Partnerships in Australia

Local government is a rich source of accurate and detailed spatial information which is utilised not only at the local level but increasingly at other levels of government. In countries that have a system of federated states, such as Australia, the building of state and national level SDIs are increasingly reliant on the involvement of local governments. Although institutional problems still present some of the greatest challenges in building multi-jurisdictional SDIs, the technical and physical capacity of the smaller jurisdictions can impact on their ability to participate with larger and usually better resourced jurisdictions.

The mixed methods research design illustrated in Figure 1 consists of a four stage process which culminates in the synthesis and development of a new model for local-state government SDI partnerships.

This design draws together a generalised design framework for case study approaches proposed by Yin (1994), Onsrud et al. (1992), Lee (1989) and Williamson & Fourie (1998). The three stage process of Williamson & Fourie (1998) is extended to include the quantitative methods which have been used to identify and measure the impact and effectiveness of the data sharing partnership models. The design also includes the integration both qualitative and quantitative results and a process of model validation.

A number of mixed method design frameworks have emerged in recent times (Creswell et al. 2003; Johnson & Onwuegbuzie 2004; Nedovic-Budic Unpublished; Tashakkori & Teddlie 1998; Wehn de Montalvo 2003a). The design in Figure 1 follows the process of contextualising the research and clarification of the research questions, conduct of organisational case studies, a quantitative survey and finally the integration and synthesis of results. The four stages are discussed in more detail below.

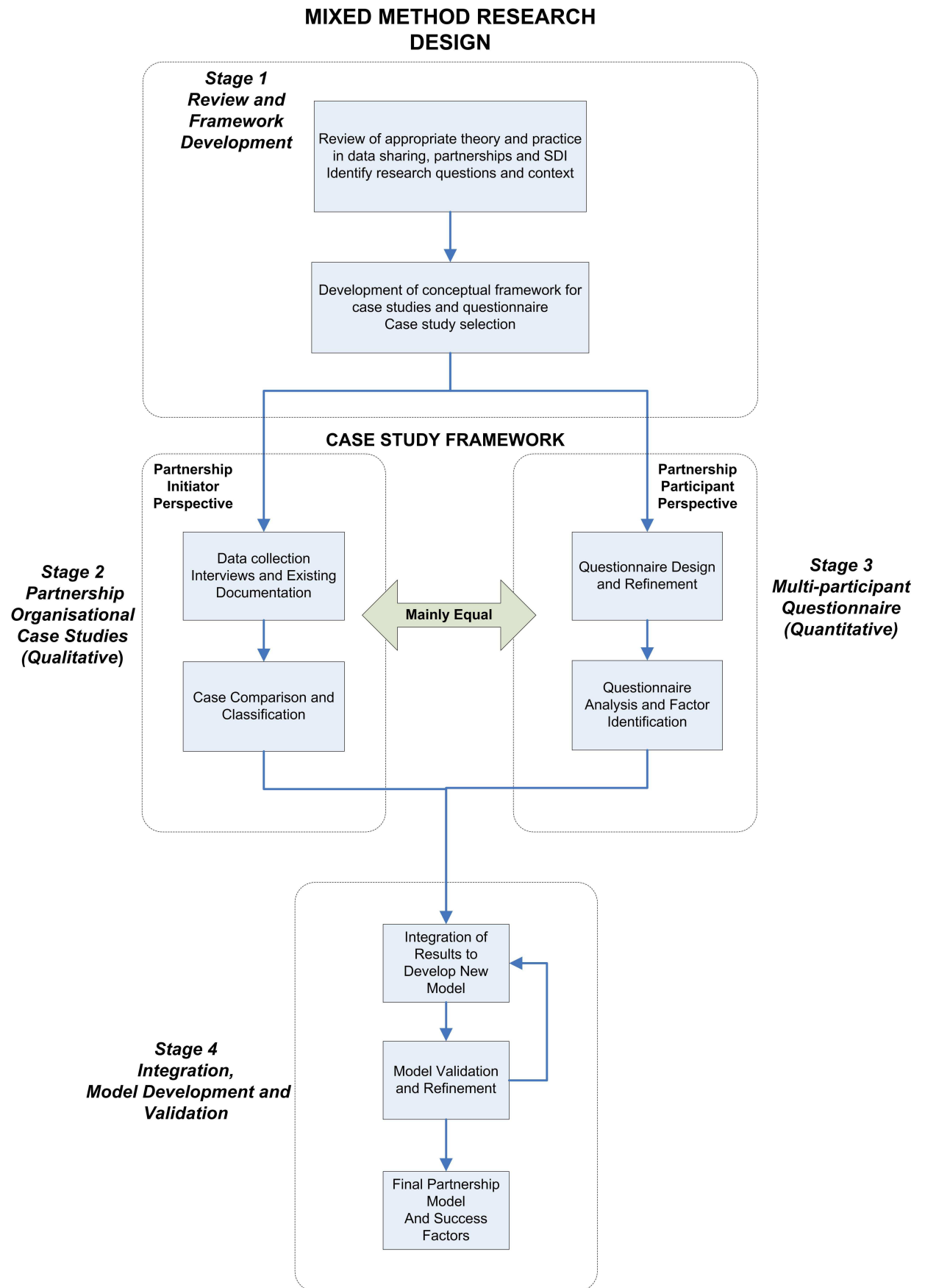


Figure 1: A Mixed Method Research Design

Stage 1 – Review of Theory and Framework Development

The first stage of the research provided the foundation for development of a suitable conceptual framework for the initial data collection and assessment. For the organisational case studies of the state governments, the conceptual framework was developed from organisational and collaboration theory. A variety of researchers (Child et al. 2005; Gray 1985; Mulford & Rogers 1982; Oliver 1990; Prefontaine et al. 2003) have identified a number of important dimensions of collaboration including the collaborative environment, the determinants for collaboration, the collaborative process and the performance of collaborative initiatives. The theory within these areas enabled the development of a basic framework for exploring the initiation, development and operation of the state government partnerships. One of the primary purposes this research of the data sharing partnerships was to investigate their contribution to SDI development at local and state levels. Therefore, conceptual framework for the local government questionnaires was developed around the SDI elements identified by a range of authors (Coleman & McLaughlin 1998; Groot 1997; National Research Council 1993; Rajabifard & Williamson 2001). These components include data, people, standards, institutional framework/policies and technology/access arrangements.

Case Study Selection

The case studies investigated existing data sharing partnerships between state and local governments in Australia which had been established to facilitate the sharing of property related data. The three Australian states of Queensland, Victoria and Tasmania were chosen as the basis for the research study. The states were selected on the basis of an existing data sharing arrangement being in place and a variety of characteristics including geographic area, population and the number of local governments. The State of Queensland is the second largest state in Australia by area, and also contains a large and varied group of local governments. Its capital city of Brisbane, represents one of the largest local government jurisdictions in the world. Queensland also has a relatively large number of local governments, 125 in total, including many in remote rural communities with very small population bases.

At the other end of the spectrum, the State of Tasmania is a compact island state that has only 29 local governments and approximately half a million people. It provided a contrasting study of a smaller jurisdiction both in area and in the number of partnership participants. The third case selected was the State of Victoria with 79 local governments. Victoria is one of the most populated states in Australia and is also well advanced in its partnership arrangements. It complements the other two state jurisdictions and is characterised by having a mid sized geographic area and number of local governments. In summary, these three states represent almost 50% of Australia's population base, approximately 35% of the total number of local governments and about 25% of the geographic land area. The states provide a contrasting mixture of local governments, geography and institutional arrangements.

Stage 2 – Organisational Case Studies of Partnerships (Qualitative Component)

A key objective of the qualitative component of case studies was to examine the organisational frameworks of each of the state government initiated partnerships to describe and then classify the three operations. A structured case study methodology as recommended by Yin (1994) was utilised. A SDI framework consisting of the key areas of policy, data, people, access arrangements, and technology/standards provided the basis for the areas of questioning and investigation.

Case Study Data Collection

For this qualitative component, the methods of data collection focussed on two primary forms of evidence, namely interviews and existing documentation. A semi-structured interview technique was utilised to collect data from staff within each state government agency that was charged with the management of the partnership arrangement. The structure of the interviews broadly covered the following topics:

- organisation overview and role of partnership;
- historical developments within the partnership;
- existing policy arrangements;
- an understanding of the data and data sharing processes;
- operational and resource aspects of the partnership;
- organisational and institutional arrangements; and
- barriers and issues – legal, technical, economic, institutional.

A list of the general questions utilised for the interviews is contained in Appendix 2. The people interviewed included the partnership initiators, partnership managers and staff involved in various data sharing activities.

The other key source of evidence for the case studies consisted of historical documentation which had been in existence since the design and development of the partnership. The documentation varied from state to state but included some of the following:

- initial proposal documents for the partnership;
- descriptive documentation such as that available on websites;
- examples of individual partnership agreements;
- internal review documents of the arrangements;
- external consultancy reports; and
- conference and journal papers describing the arrangements.

In the evaluation of each of the documents, care was taken to recognise the strengths and weaknesses of the various forms of documentation, particularly with respect to any bias. In case studies, one of the most important uses for documentation is to corroborate and augment evidence from other sources to minimise possible bias.

Case Study Comparison and Classification

An important objective of the research was to understand the differing partnership arrangements in existence and to compare and classify these data sharing partnerships. The comparative component of the research provided a mechanism to compare the

partnerships one on one, as a means to better understand each partnership's structure and operation. Basic comparators included:

- Length of partnership;
- Extent of data shared;
- Quantification of resources;
- Communication mechanisms and frequency;
- Number of partners;
- Geographic extent; and
- Environmental context.

To further explore the nature and sustainability of the SDI partnerships in comparison to partnerships operating in other disciplines, a typology for classifying the partnership models was developed. The typology included the following dimensions:

- Nature of partnership;
- Partnership goals;
- Negotiation processes;
- Resource or funding model;
- Governance model;
- Project management;
- Performance measurement; and
- Maturity and organisational learning.

Stage 3 – Multi-participant Questionnaire (Quantitative Component)

In order to assess the motivating factors, constraints and effectiveness of local-state government data sharing partnerships a questionnaire was designed and delivered to the local governments in the three state government jurisdictions. The purpose of the questionnaire was to assess a range of factors that might influence the success or otherwise of the data sharing partnerships, particularly from a local government perspective. The design of the questionnaire was constructed around the existing knowledge of SDI frameworks, especially the participants understanding of policies, data holdings, people, access arrangements and standards/technology. In addition to the SDI framework, the questionnaire also investigated the organisational setting, partnerships and collaborations and the participants perspectives on the existing partnership arrangements.

The questionnaire consists of eight sections as follows:

1. ***Part 1 – The Organisation*** – This section quantified the size of the local government in terms of properties and staff, provided an assessment of their ICT capacity and the local government's specific capacity within the GIS or spatial information area.
2. ***Part 2 – Policy on Use of Spatial Data*** – This section explored the existing policies within the local government for access and pricing of spatial information including issues of legal liability, copyright and privacy.
3. ***Part 3 – Accessing Spatial Data*** – This section examined the organisation's arrangements for accessing and pricing of spatial information both from an internal and external user's perspective.

4. ***Part 4 – About Spatial Data*** – This part of the survey examined the sources of spatial data, the key providers, and the status of their data holdings.
5. ***Part 5 – Spatial Data Standards and Integration*** – This section investigated the use or otherwise of standards and the degree of integration of the organisation's spatial data systems with other core systems. This provided an indication of the level of maturity and integration of spatial information systems within the organisation.
6. ***Part 6 – About People*** – This section explored the human resources of the organisation including staff turnover and access to training.
7. ***Part 7 – Partnerships and Collaboration*** – This section explored the perceived strength of the organisations relationship with a range of organisations, the barriers/obstacles for collaborating, the drivers for collaboration and the types of existing collaborations.
8. ***Part 8 – Specific Data Sharing Partnerships*** – The final section examined the organisation's specific attitudes and experiences with an existing SDI partnership.

For the majority of questions the responses were measured on a five point Likert scale in order to standardise and categorise the responses. A number of questions collected numeric data to quantify staff and the number land parcels for example. Areas were also available for participants to provide comments on each area of the questionnaire. A draft questionnaire was developed in hardcopy form and distributed to three local governments to check for terminology and understanding of the questions being asked. The questionnaire was then converted across to a web form to enable the digital collection of the data to facilitate a higher return rate. The web based questionnaire was then tested internally and also externally through two local governments to ensure that the URL provided was accessible and also that responses were being recorded at the web server.

Questionnaire Distribution and Analysis

The distribution of the questionnaire was undertaken after consultation with each of the state agencies. The questionnaire sought responses from local government in a number of areas that could reflect poorly or otherwise on the state government agency, so a degree of sensitivity was required. Privacy of customer or partner information also became an issue in the questionnaire distribution process. Under state and federal government privacy legislation permission must be sought from individuals before their contact details can be disclosed. This became a significant issue as it was critical that the questionnaire was sent to the correct partnership contact person rather than the indiscriminate targeting of local government staff. The privacy issue was addressed by the state government agency making the initial contact to the LGA and seeking their permission to be involved with the study. Once they agreed their details were passed on to the researcher. The response rate to the questionnaire was 56% which was considered extremely satisfactory given the diversity of local governments being investigated.

The data from the questionnaires was automatically collected into an excel spreadsheet via the web server. This process was extremely effective as it eliminated encoding and transcription errors and facilitated direct transfer to the analysis software (SPSS). Initial descriptive statistics identified a number of early trends in

the responses from the different state jurisdiction, particularly in the area of information policy and outcomes that had been delivered through the data sharing partnerships. Factor analysis was then utilised to identify clusters of variables (components) which were then correlated with the outcome variables using a regression model. Through this modelling components which had greater contribution to the success of the partnership outcomes were identified.

Stage 4 – Integration, Model Development and Validation

After the completion of the case studies and questionnaire analysis the results were integrated to develop a new data sharing partnership model. The case study results assisted in clarifying the initial conceptual framework and typology of the existing partnerships in each of the three state government jurisdictions. The descriptive and comparative analysis enabled a clearer understanding of the organisational structures, policy objectives and goals, partnership structure, progress and outcomes, resource requirements and sustainability. The perspectives gained from these cases assisted in answering some of the research questions relating to the “how” and “why” the spatial data sharing initiatives were put in place and identified some of the major issues relating to their implementation. Importantly, it should be noted that the descriptive case studies primarily provided the perspective of the partnership initiator and manager rather than partnership participants.

In order to progress the research towards the development of a generic model, the perspectives of local government were required to provide a more balanced view of the success of the data sharing arrangements. The results of the questionnaire identified the capacity and motivations of local governments to participate in data sharing partnerships. The quantitative analysis enabled these factors to be identified and modelled against the partnership outcomes.

Inter-jurisdictional (local and state levels) will inevitably create challenges for each level of government. The research found that state – local government data sharing partnerships differ in a number of ways from other intra-jurisdictional data sharing. Firstly, for a comprehensive solution to data sharing between state and local government the partnership arrangements need to be established on a one-to-many basis. The qualitative case studies identified that the development of a systemised approach to partnership negotiation, data licensing, data maintenance, partner communication, data exchange and project management is critical to the success of these endeavours.

Table 2: Summary of Qualitative Assessments on the Performance of State Partnerships

| Collaborative Stage | Victorian Property Information Project (PIP) | Queensland Property Location Index (PLI) Project | Land Information System Tasmania (LIST) |
|--|--|--|--|
| Establishment and Direction Setting <ul style="list-style-type: none"> - Goal setting - Negotiation - Agreements | A clear common goal for the project. Well managed process of negotiation and development of policy and institutional structures. | Business case for the project was limited. Goals unclear and policy framework worked against data share agreements. | High level strategy and clear overall goals. Policy and negotiations strategy well structured. Agreements very detailed |
| Operation and Maintenance <ul style="list-style-type: none"> - Project management - Maintenance - Resources - Communication | Project management has been good since inception, maintenance infrastructure developed progressively, some resource limitations. Communication with stakeholders and partners has been positive. | Poor institutional arrangements led to poor resourcing and project support. Culture of inter-jurisdictional sharing only now emerging. Confused channels of communication due to dispersed organisational structure. | LIST started with strong overall leadership and project support. Project generally well resourced and technology focussed. Issues of local government communication and data maintenance now starting to emerge. |
| Governance <ul style="list-style-type: none"> - Governance structures - Reporting - Performance management | Early project efforts focussed on negotiation and data exchange. Performance management now part of the process. Improved governance arrangements emerging. | There appears to have been little performance management or reporting. No governance structure in place which includes the key stakeholders. | Initial governance and reporting structures were appropriate, but as project matures new governance models are required. |

Table 2 identifies some of the differences among the three state jurisdictions. Both the Victorian and Tasmania data sharing partnerships were well resourced in the early stages of development, had clear goals and strong leadership. However, the Queensland partnership struggled to gain the support of local governments because of poor initial funding and a restrictive policy framework that limited the local governments in conducting their business activities using the state government data.

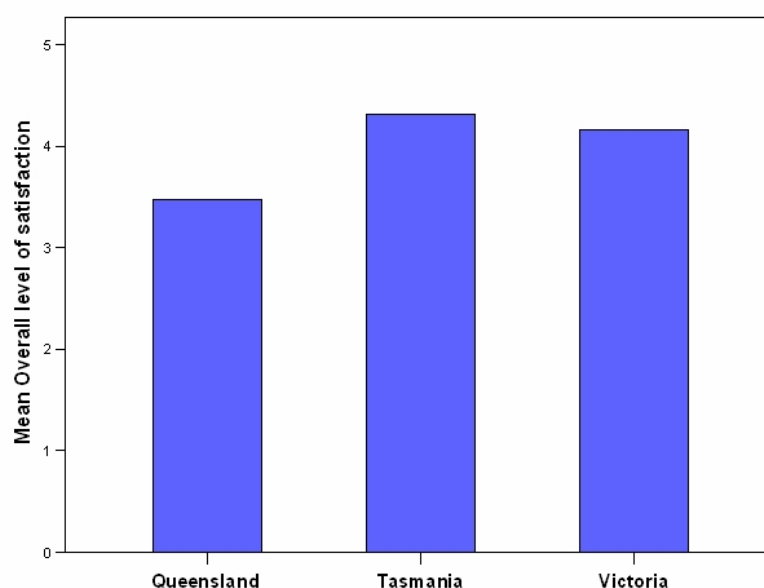


Figure 2: Overall Level of Satisfaction Indicated by Local Governments

The findings of the state government level investigations were supported by the quantitative statistics of the local government survey (Figure 2). The areas of weakness in the partnership processes identified at the state government level were reflected by the overall level of satisfaction in the local government survey. Areas such as policy formulation at the state government level have a strong influence on the corresponding policy developments at the local level. Clear partnership goals, continuous and open communication and adequate funding also have a strong influence on partnership outcomes.

Discussion and Conclusions

The research methodology described above builds on similar models proposed by Yin (1994), Onsrud et al. (1992), Lee (1989) and Williamson & Fourie (1998) for case study approaches through the addition of quantitative methods. The mixed methods approach has already been utilised successfully by a number of researchers in spatial data sharing e.g. (Wehn de Montalvo 2003a) to assess the willingness to share spatial data and (Nedovic-Budic Unpublished) to assess adoption of GIS technology. However, it is the possible utility and validity of the approach which deserves further comment.

Qualitative approaches such as case studies have often been viewed as being inferior to quantitative approaches, suitable primarily for either stand-alone descriptions of phenomena or as exploratory research preliminary to the real research of generating hypotheses and testing them statistically (Benbasat 1984). Although similar comments were common in early case study approaches, frameworks now exist which provide both a rigorous (Yin 1994) and scientific approach (Lee 1989) for the development of case studies.

In this research, the case study method was selected as the primary qualitative strategy to examine a number of spatial data sharing partnership models in different jurisdictions, particularly from an organisational perspective. The case study approach was deemed to be suitable in the context of examining these partnership models for a range of reasons. Firstly, data sharing partnership models can be studied in their natural settings and provide the opportunity to learn from state of the art approaches and practice (Benbasat et al. 1987; Maxwell 1996). Secondly, the case study approach enables the “how” and “why” research questions, specifically the nature and complexity of spatial data sharing partnerships to be investigated (Benbasat et al. 1987; Yin 1994). Thirdly, the case study approach can provide a suitable framework for analysis and classification of partnership models (Lee 1989; Yin 1994), and finally, the case study approach provides a high level of data currency as well as data integrity (Bonoma 1985).

The incorporation of the quantitative dimension within the case studies through the use of a questionnaire strengthens the case study approach. The strength of this component lies in the ability to efficiently include a large number of participant perspectives and to analyse this data comprehensively and quickly using computing methods. It also provided the potential to assist in identification of key factors, correlations and possible trends which will be instrumental in defining an improved partnership model.

In the study the qualitative and quantitative components were generally completed concurrently. The qualitative organisational cases in reality were ongoing with some periodic updates of the organisational environment. The questionnaires were completed over a six-nine month period and reviewed as the need arose. The evidence from each component was treated as equal although this was often difficult to confirm. Finally, the integration of the two strategies was achieved at the analysis stage of each of the sets of results. This process facilitated the corroboration of results and confirmation of the importance or otherwise of issues.

The triangulation of methods as depicted in Figure 3 utilises multiple sources of evidence including existing theory, case studies and survey results to inform the final model. The internal validity of the model should, in theory, be superior to each of the singular approaches. However, care must always be exercised in the early conceptual development and design as the potential risk exists of rather than the method being complementary, it could in fact provide conflicting results which could work to confuse at the stage of integration.

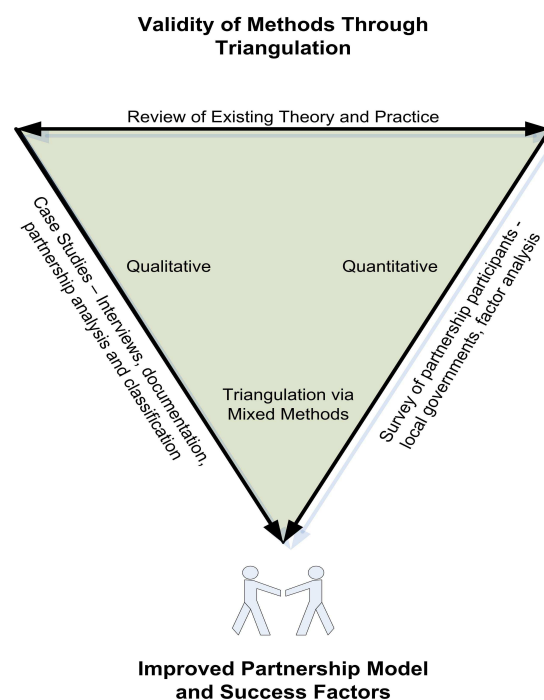


Figure 3: Validation of Outcomes through the Mixed Methods Approach

The weakness of the case study approach is often identified as the limited sample of cases being analysed and therefore the difficulty in attempting to generalise the case study findings. By undertaking a more wide-ranging survey of a large number of partnership participants, the findings of the case studies were strengthened.

The purpose of this paper was to examine the methodological approaches and issues which arise when researching spatial data sharing partnerships and their relationships to SDI development. As these spatial data sharing partnerships continue to emerge it is important to understand their success and contribution to building various levels of the SDI. In the past, discrete research approaches and models have provided a valuable starting point for measuring and classifying data sharing efforts. However, it

is suggested that a mixed methods approach provides a useful strategy to build on the existing theory and to more rigorously evaluate the success or otherwise of these partnership efforts.

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